

*Final*  
~~Progress~~ Report For:

AMMONIATION OF CHAFF AND STRAW

ADF #D-86-01-0189 (NE 26)

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1. Objective

- a) To demonstrate the application of anhydrous ammonia to chaff and cereal straw to create an economical feedstuff for wintering beef cattle.
- b) To demonstrate alternate feedstuffs in Northeast Saskatchewan where traditional forage yields are drastically reduced by drought.

2. Project Design:

- A- Ammoniation of Round Straw Bales
  - Francis Jungwirth, Cudworth

## Method -

A stack of sixty five wheat straw and barley straw bales were piled in a 3x2x15 bale long stack. The stack was covered with black plastic. A fish net was used to hold the plastic from flapping on windy days. Anhydrous ammonia was pumped into the stack through a twenty foot 2" diameter pipe with 3/16" holes spaced every 16" on the pipe. Half the anhydrous ammonia was pumped in from each end of the pile. The anhydrous ammonia was added at 3.5% of dry matter weight of the straw pile.

## Results -

The bales were sampled before and after treatment. The injection of the ammonia went very smoothly with very little billowing of the plastic cover, possibly due to the high (30%) moisture content of the straw. The treated straw was fed to replacement heifers along with six pounds of barley per day. The heifers readily consumed 50% more ammoniated straw than untreated straw. The barley straw (Johnson variety) was coarse and not as readily eaten as the wheat straw.

The 3x2 pile had frozen snow in the trough in the middle of the top row. This was a nuisance and increased risk of puncturing the plastic prior to using the bales.

## Analysis - 90% Dry Matter

|                          | Protein % | Estimate Energy (TDN) % |
|--------------------------|-----------|-------------------------|
| Untreated straw          | 4.34      | 36                      |
| Ammoniated - centre pile | 8.67      | 45                      |
| Ammoniated - side pile   | 10.54     | 48                      |

There is a marked difference between ammoniated straw quality at the centre of the stack and along the sides. This may be due to sampling error where the untreated test was a blended sample of all bales and the two treatment samples were site specific.

#### Conclusions -

- 1) Straw treated with anhydrous ammonia will make an economical feed ingredient for wintering replacement heifers.
- 2) High moisture levels in the straw bales facilitate fast uptake of the anhydrous ammonia.
- 3) Straw treated with anhydrous ammonia is very palatable.
- 4) The project cost of \$35 per ton includes anhydrous, fish net and labour allowance of \$10 per ton.

-B- Ammoniation of Chaff  
- Bob Jackson, Sylvania

#### Method -

A stack of 75 tons of wheat and barley chaff was stacked in the Jackson yard. The pile was about 20 feet wide, 8 feet high and 200 feet long. The chaff was hauled in with a McKee Wagon and the piles were pushed together with a front-end loader tractor. About 2000 gallons of water was pumped into the stack at 2 feet and 5 feet levels above the ground and every 6 feet down the side of the stack. This raised chaff moisture levels to over 20%. After three days, anhydrous ammonia was injected using a 20 ft. pipe, 2 ft. above the ground and every 8 ft. along the stack. The stack was not covered.

#### Observations and Results -

The ammonia was applied on a calm day and there was a problem with free ammonia gas. The stack settled to about 70% of its original column. Water and ammonia appeared to be well dispersed in the stack at feeding time. Wet ground under the pile created a mud problem that had to be overcome by peeling off chaff and letting ground freeze. There was gassing-off of ammonia through the top of the pile in spite of a heavy wet snowfall the night after the treatment. There were also pockets in the pile containing high levels of gas; these were evident when feeding.

The ammoniated chaff was added whole into the grinder mixer with hammered barley. The feeder steers found it very palatable and when combined with mineral and 0.75 lb of liquid supplement, produced gains of 2.18 lb per day over a 100 day period. The feeders were 575 lb. Charlais cross steers. Ammoniation increased the protein content of the chaff by 6.6% and the estimated energy (TDN) by 2%. Similar demonstrations through the province have shown estimated energy increases of 5-6% and similar increase in protein value.

Chaff Analysis (90% Dry Matter)

|                        | Crude Protein (%) | Estimated Energy (%TDN) |
|------------------------|-------------------|-------------------------|
| Wheat Chaff            | 6.8               | 41                      |
| Ammoniated Wheat Chaff | 13.4              | 43                      |

Conclusions -

- 1) Ammoniation of chaff can provide an economical feedstuff for feedlot steers.
- 2) Demonstrations of applications of anhydrous ammonia can be hazardous. It should be handled by professionals and a good video may be better than a hands-on group of farmers attending a demo.
- 3) Methods of applying water to get uniform distribution and no mud under the chaff pile are needed.
- 4) An analysis of germination of seeds in chaff is needed. Covering a pile may be necessary to destroy the germination completely.
- 5) The cost of the chaff including hauling, ammoniating and material was about \$25 per ton.

- C - Ammoniation of Canola Screenings  
- Tom & Jim Handford, McKague

Method -

A pile of 450 ton of Canola Screenings was heating. A 20 ft. application pipe was inserted 2 feet above ground every 6 feet down the side of the pile and 1% anhydrous ammonia was added to the uncovered pile. The anhydrous ammonia was added to stop heating.

Results -

The anhydrous ammonia stopped the heating and improved the nutrient quality and the palability of the canola screenings. The screenings were fed to wintering cows, replacement heifers and in a creep feed for calves.

There was a heavy snow cover on the stack when treated and there was very little loss of anhydrous ammonia during application.

The ammoniation of the screenings cost about \$3.00 per ton.

### Economic Analysis

The ammoniated chaff, straw and screenings are compared to the relative value of four standard feeds, barley, canola meal, 1:1 Ca:Ph mineral and ground limestone. The nutrients valued in the calculation are protein, energy, calcium and phosphorus. While the chart does not address all the factors in pricing a feedstuff, it strongly indicates ammoniated feeds are able to reduce feed costs if they fit into other feed management practises on the farm. The cost of ammoniation and the time involved is paid for by quality increases in the final product.

| FEED<br>----  | %<br>PROTEIN | %<br>TDN | %<br>CALCIUM | %<br>PHOS | COST<br>\$/TONNE | VALUE<br>\$/TONNE | COST-<br>VALUE |
|---------------|--------------|----------|--------------|-----------|------------------|-------------------|----------------|
| Barley        | 11.5         | 74       | .05          | .25       | 69               | 69                | 0              |
| Canola        | 37           | 68       | .4           | .9        | 190              | 190               | 0              |
| Mineral       | 0            | 0        | 19           | 19        | 550              | 550               | 0              |
| Limestone     | 0            | 0        | 37           | 0         | 110              | 110               | 0              |
| Cost Factors: | 4.09         | .21      | 2.97         | 25.97     |                  |                   |                |

| FEED<br>---- | %<br>PROTEIN | %<br>TDN | %<br>CALCIUM | %<br>PHOS | COST<br>\$/TONNE | VALUE<br>\$/TONNE | COST-<br>VALUE |
|--------------|--------------|----------|--------------|-----------|------------------|-------------------|----------------|
| Alfalfa Hay  | 14           | 54       | 1.3          | .22       | 70               | 78.01             | -8.01          |
| Ammon. Straw | 10.54        | 48       | .2           | .12       | 35               | 56.76             | -21.76         |
| Ammon. Chaff | 13.43        | 43       | .52          | .12       | 25               | 68.51             | -43.51         |

### Publicity and Use of Information from Project

The procedures and the results have been discussed at livestock nutrition meetings and in individual consultations with farmers. A farm news broadcast from the Bob Jackson chaff project was featured on local and provincial scenes.